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BEET SUGAR,

Its Economical Production in the Province of Quebec.

A Paper read before the District of Bedford Agricultural Association, on the 9th March, 1877
By E. A. BARNARD, Esq., Director of Agriculture, Department of Agriculture, Quebec.

PART I.—BEET SUGAR.

Beet sugar may be called one of the productions of this century; and it is not one of the least fruitful inventions of this wonderfully inventive age. In 1747, Margraff, a distinguished German chemist, made known to the world, for the first time, that several root plants contained sugar, amongst which is the beet. However, it was only in 1796 that the first efforts to manufacture beet sugar were made by Ch. Francois Achard, a disciple of Margraff. These efforts proved successful and several manufactories were started in Germany, at the beginning of this century. A book was published on this subject by Achard, in 1812, giving such lucid information on the whole question that it took nearly half a century before more light could be brought on it. Achard's writings on the economical production of beet sugar in Europe, must have been very effective indeed, since several continental governments at once took up the subject. Napoleon the first, who, by his peculiar genius, foresaw clearly the political use to be derived from this source, gave the greatest impetus to this new production which received an additional assistance from the fact of the continental blockade, against England, of most continental ports in Europe. Even Russia paid as much as 50,000 roubles to assist in the establishment of the first beet sugar factory in that country. France lavished its millions of francs for the same purpose, and the different States of Germany offered and gave

all the assistance they could to similar establishments in their respective provinces. Even England seems to have taken flight at the continental efforts to ruin its colonial trade in sugar,—for it is stated on good authority, that Achard was offered \$30,000 at first, if he would only state, in print, that he had been mistaken in his assertion that beet sugar could be economically produced. And as early as 1802, this offered bribe was increased to \$100,000, but it was again scornfully rejected by the proud but honest German. It would seem that England's spite could not be hidden, and that somewhat later, Sir Humphrey Davy was induced to state in his "Treatise on Agricultural Chemistry," that beet sugar was *entirely too bitter* to be of any use. The discussion must have been *bitter* indeed—but not so the sugar, which, when refined is identical to the very best cane sugar; so much so that the ablest chemist, or commercial buyer in the world could not, in the presence of samples of each kind, say which is which, were it to save his life.

Napoleon I has been justly called the father of this industry. He lavished both honors and fortune on those who were the most successful in its establishment,—but his downfall nearly ruined this offspring of his. The alliance of continental powers with England against France, brought back the predominance of England's commercial interests on the continent—and the very elastic principles of free trade nearly crushed this industry entirely out of ex-

istence. Although Germany and Russia had already lavished millions of francs in the manufactory of beet sugar, they allowed the imported cane sugar to compete fully with the beet sugar, which, being yet unable to support this competition, was completely ruined in all countries but France.

Even in France, for many years, the theories of free traders had their able and nearly all powerful defenders; so that beet sugar could barely keep up a foothold. It would no doubt prove interesting to follow out this all but deadly combat between free trade and protection in France on this question of beet sugar.

However, I will only say that to me it looks as if a few very clever, if not always very honest men managed to enrich themselves and their friends, but not without impoverishing the mass of agricultural laborers. To perform this clever trick requires great ability, indeed, in handling bright, dazzling theories, which like fine dust, can of course thoroughly blind people, if only thrown cleverly and well in their eyes. But yet, those clever things could not be repeated,—and accomplished again—were it not for that very numerous class of so-called statesmen, who in order to maintain their prestige, are always in search for the easier and least unpopular mode of taxation, if not the most judicious and most encouraging system for the fostering of home industries.

So was it in France up to 1829, when the whole production of beet sugar did not exceed 4,000 tons annually, although millions over millions had been lost in the attempt to establish this industry without sufficient protection in its infancy. I cannot refrain from reading here the following extract on this question from Mathieu de Dombasle, France's greatest agriculturist of the age and one of its best patriots. In discussing this very subject of the national importance of fostering the sugar beet industry, he said, in 1829:

"France produces but a small proportion of the sugar consumed in the Kingdom. However, the increase in production has been so rapid within a few years, and so

many manufactories are being opened, that it is easy to foresee, if nothing happens to deaden this movement, that it will not take many years before France can suffice to itself in this production. It is somewhat remarkable that this industry has taken root only in France; in Germany, where the manufacture of beet sugar had its first beginning,—where it had taken a considerable extension, under the impulse of the continental blockade, it was completely crushed out, by the free competition of the sugar from the Indies." He says further, "It is probable that a nation conveniently situated for this industry, and which will have secured its foothold in the country, before other nations can do so, may later—and perhaps for many years—not only suffice to its own consumption, but also sustain a successful competition against foreign sugars even in foreign markets." I may say here that in Canada the protection in favor of beet sugar factories would be enormous, and more than was ever asked for in Europe,—imported sugar being taxed about 45 per cent. on its cost.

M. de Dombasle then goes on to show how favorable the new industry would become to agriculture in general, and how much it was for the interest of the whole French nation, and therefore of the French Government to give to beet sugar factories the encouragement necessary to their solid establishment. He also demolished entirely the arguments to the contrary, advanced with great success up to that time, by a whole school of free traders in France of which Edmond Say was the head.

Let us now see how far Mathieu de Dombasle's prognostications in 1829, have proved correct. In 1836, seven years after the writing above cited, the production of sugar in France, which was only 4,000 tons in 1829, increased to 40,000 tons. In 1857 it was only 49,000 tons. About this time Napoleon III, turned his attention to this subject; its protection was secured and the following results were attained:—In 1862, 170,000 tons of sugar were made in France; in 1868, 275,000 tons; in 1873, 396,000 tons; in 1876, 462,259 tons;

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or an increase of nearly 125 fold in 47 years, for France alone.

We have seen above that up to 1830, no beet sugar factories existed in Europe elsewhere than in France. The writings of M. de Dombasle, and others of the same school, created a stir in Belgium, and then in Germany, with the following results:—

	1876-7	1875-6	1874-5	1873-4
Germany.....	280,000	346,815	250,708	289,243
France.....	225,000	462,259	460,877	396,578
Russia.....	250,000	245,006	222,500	102,851
Hungary.....	155,000	153,922	120,720	167,058
Belgium.....	50,000	79,796	71,079	73,516
Holland.....	30,000	30,000	30,000	35,000

990,000 1,317,623 1,145,885 1,164,243

Showing an increase of beet sugar production in forty-seven years, of 330 fold.

But what is more surprising still, and what does not seem to have been expected by any of the writers of that epoch, is that the consumption of sugar seems to have increased in the same enormous ratio as the production:—thus in France, in 1829, the consumption was 35,000 tons, or about 2½ lbs. per head; it is now 265,000 tons or 16½ lbs per head. In England in 1844, the consumption was 236,143 tons or about 16 lbs per head; it is now, including molasses, 900,000 tons or about 62½ lbs per head.

The following table, giving the consumption of sugar in different countries, may prove interesting:

	Tons.	Population.	Per head
Great Britain.....	900,000	31,629,300	62.58
Germany.....	315,000	42,756,900	16.19
France.....	275,000	36,377,500	16.61
Russia.....	250,000	82,135,709	6.70
Austria.....	170,000	20,395,000	18.33
Spain.....	50,000	16,835,700	6.50
Belgium.....	50,000	4,827,800	22.65
Holland.....	30,000	3,579,400	18.50
Turkey.....	25,000	23,610,000	2.25
Sweden & Norway.....	20,000	5,870,300	7.5
Portugal.....	15,000	4,324,000	7.5
Denmark.....	15,000	1,785,000	18.25
Switzerland.....	11,000	2,659,600	9.
Greece.....	3,000	1,457,109	4.50
Europe.....	2,124,000	278,243,200	17
United States.....	750,000	38,923,000	42.35
British Colonies.....	200,000	50,000,000	8.8
Total.....	3,079,000	367,168,200	17.5
Canada.....	82,491	4,365,000	39.5

The total production of beet sugar and of cane sugar, in 1874, was, as follows, for all sugar manufacturing countries:

Total cane sugar manufactured, in 1874 1,840,986 tons; do, do, of beet sugar, 1,110,166 tons. Total, 2,951,152 tons.

It will, no doubt, be observed that all countries producing sugar, either by themselves or their colonies, use a great deal more sugar than others, except, however, our own country, which proudly stands as third on the whole list, although it produces none other than the maple sugar, which, however, if counted, would very likely place us second on the list, if not the very first. Is it surprising that we should find so many sweet, sugar-coated mouthed children around us everywhere—not to mention sweet-lipped grown up children?

Let us now examine briefly the wonderful effects of this industry on the agriculture of all the countries where it has been implanted. This would apply to Canada if sugar beets were produced.

In 1850, in France fears were entertained at what was then considered the wonderful increase of beet culture for the production of sugar. It was believed by many that this increased production of beets would cause a proportionate decrease in that of cereals and of meat. A legislative enquiry was consequently ordered and the following facts clearly proved: The district of Valenciennes in 1813, (one of the best cultivated in France) produced about twenty bushels of wheat to the acre; in 1833 it produced thirty bushels. Before beet culture was established, the whole production of wheat was 710,000 bushels, it rose (in 1833) to 1,192,000 bushels, an increase of over 50 per cent. In 1822 the whole district fed 400 oxen; nine years later (in 1831) it fattened 10,784, or an increase of over 25 to 1.

The following is equally extracted from an official document published by the French Government in 1873:

"There exists in the north of France, a certain number of districts which have attained the maximum of agricultural production. Thus, in favorable seasons, these localities produce an average to the acre of 40 bushels of wheat, of 45 tons of beets, of 350 to 400 bushels of potatoes, &c.

What causes this prodigious prosperity? In some parts it is due to the use of Flemish manure, which agriculturists from the north have utilized for centuries; in others where human feces is not collected, it is entirely due to the production of beets. It has been repeated on all sides, and yet it cannot be too much said: the cultivation of beets is that which has contributed most to agricultural progress."

I might give page after page of similar statements, not only from French authorities, but also from all the countries where this wonderful industry exists. However, the tables given above speak higher in favor of beet sugar than all I could say. It is every where shown that the several crops have tripled on an average, wherever the soil has been cleaned by the beet crop, and manured by the enormous quantity of cattle necessary to utilize the remains of the beet; after the sugar has been extracted from it. It has been conclusively shown that the increase in cattle, in these regions has been at the rate of over 25 to 1.

A Belgian gentleman who wrote a French pamphlet on the "Foundation in Canada of the manufacture of beet sugar," thus epitomises correctly the following advantages offered by this industry, he says: "An enlightened practical study on the subject, of half a century, shows in the most conclusive way:

1st. That the cultivation of beets, far from impoverishing the soil, vastly increases its fertility, by the production of an abundant supply of manure." He might have added: which actually does not cost a cent to the farmer. He says also:

"2nd. That by the very many plowings, harrowings, hoeings, &c., indispensable to this crop, the land is prepared in the very best manner for the crop which follows." I add again, and especially for the following grass and hay crops, so productive and so necessary in this country; he says again:

"3rd. That this hoed crop enables the farmer to follow the best system of rotation for his farm."

4th. That not only does the sale of the beet to the sugar factory cover the whole cost of the production, and of the cleaning

and manuring of the soil for future crops but that generally it brings to the farmer a larger cash return per acre than any other crop he could raise.

"5th: That it enables the farmer to obtain in summer the assistance of a great number of hands, who find a profitable occupation, at the manufactory, for the whole of the winter; thus creating a better market for farm produce, and generally a source of wealth for the country which can hardly be overestimated."

Before leaving this part of my subject, it may be useful to say a word of the refuse from the beets after the sugar has been extracted. This refuse is called pulp, it is generally in cakes and weighs about 22 per cent. of the original beet. Its feeding value is somewhat greater than that of beets—containing as it does all the fibrous matter, besides a large per cent. of sugar, and less water than in the beet. Although it would be useless to enter here into any of the details of the manufacturing process, it may be well to explain how it is that the residue is richer than the original beet. Good sugar beets contain from 10 to 16 per cent. of sugar, about 80 per cent. of water, the rest is fibrous matter, salts, &c. The sugar in the juice is contained in millions of small cells which are partly broken up by the grating process to which the beets are subjected—a quantity of water varying from 15 to 20 per cent, is also added to the mass, and the whole is subjected to an immense pressure, when a large proportion of the sugar is removed in the juice and the rest remains in the cake; but as it takes about five tons of beets to one ton of refuse, it is now easy to understand how this refuse may have a larger percentage of sugar than is contained in the beet.

Numerous practical tests, have shown in the most conclusive manner, that for feeding purposes the beet refuse, or pulp, is worth about one-third as much as the best hay. That is, three tons of refuse equal one ton of excellent hay.

The sugar beet crop in France produces on good land, with high culture, an average of about 30 tons per acre. In Germany,

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the average under similar circumstances is about 20 tons, but the beets are much richer than in France, and more sugar is produced per acre than in France. The refuse thus equals about two tons of the best cured hay per acre.

PART II.

I now come to the important question : " Can beet sugar be produced in Canada at a profit ? "

This question, gentlemen, it has been my duty to study out. In 1870, I was sent over to Europe by the Government of Quebec, and later by the Federal Government with a special mission, an important part of which was to report on this very question. Although I had read somewhat on the subject, yet its practical working was new to me, and I found it necessary to look most closely into the whole matter. For this purpose I consulted the best authority in Europe, and passed, at one time, a whole month at Gembloux, in Belgium, conferring with the heads of the Belgian Government Agricultural College there. I visited also the neighbouring counties all interested in beet sugar production, which at that time created such a *furor*, that the number of manufactories were about doubled in Belgium, within two years, from 1871 to 1873. One factory existed already at Gembloux, but two others were being constructed, with a manufacturing capacity, each about three times as great as that already existing. I spent about eighteen months in Europe, and visited a considerable number of establishments, both in Belgium and Germany, the processes there followed being considered much better than those of France, which, at that time, was just issuing from a most calamitous war, which had completely paralyzed all its industries, as well as the manufactories of sugar beet. On my return, a report was published, in which I advised making experiments as to the successful production of sugar beets in this coun-

try, both as regards quantity and quality. Respecting the manufacturing process in Canada, I have come to the conclusion that with the necessary capital, appliances, and experienced management, we can manufacture the sugar here for a very small, if not an insignificant increase over the cost of production in Europe, which is from 4c to 6c, according to circumstances, for refined sugars. In this I am happy to state that my views are supported by several European gentlemen, well cognizant with the subject, and who have visited this country most carefully. If, on the one hand, labor is more expensive here than on the continent, and perhaps coal also, although this latter question is not quite proved, yet the labor question is a very small consideration if it be remembered that about 100 hands will turn out in 24 hours with the best appliances, about 20,000 lbs. of sugar, worth \$1,600 at 8c. (this sugar at the present market prices would be worth wholesale 11 or 12 cents, or produce \$2,200 to \$2,400). I must leave out many incidental questions which I cannot enter into here, but which will, I believe, bear me out in the above statement.

A factory of eight presses will produce in 150 days, about 3,000,000 lbs. of sugar, or 20,000 lbs. per day.

But I must say that we possess an advantage that no other country possesses. Whilst in Europe factories cannot be worked profitably, as a rule, over 100 days; here, on account of our special climate, we can work the beet with certainty over 200 days. Thus if the profit on the manufacturing of beet sugar in Europe be 33 per cent., which has been the case until within the two last years previous to this, we could obtain the same percentage,—even if our profit be 16½ per cent. on the beets manufactured, as we can work with this same capital at least double the amount of beets, in our long winter seasons, that they can in their exceedingly short winters. In fact, this year, the great complaint in Europe is want of cold weather; the beets vegetated and lost their saccharine qualities, to such an extent that the large increase in the price of sugar hardly cover-

ed the loss in the saccharine value of the beet. I may here state that during the years 1875 and 1876, the prices of sugar came down with a crash, from over production and other causes too long to explain, but the prices have again risen from 40 to 50 per cent. Whatever may be said against our cold climate, it possesses an invaluable advantage to the beet sugar manufacturers, who, here would be quite sure that from the 15th of October to the first of May, there would be no danger of the beets growing, if placed properly in well ventilated out door cellars. This is really an immense advantage which few beet growing countries possess; it shows once more the truth of the old saying: "It is an ill wind, indeed, which blows nobody good"—and, taking a still higher view of the subject, it reminds us again that the Creator's works are all eminently wise, and eminently useful too, if man can understand their full value!

Now, gentlemen, I need not tell you that ordinary beets grow well here, everywhere, in properly cultivated soil, which can produce good hay and grain crops. But perhaps few farmers are aware that sugar beets also do remarkably well here. Hundreds of reports have reached me this year, in my official capacity, from fortys different counties, all of them quite satisfactory, with perhaps one or two exceptions only. But what caused me some surprise is the fact that so many report the sugar beet as easier grown and with more satisfaction, in every way, than even the hardy mangold wurtzel. As to feeding qualities, there seems to be no doubt that a ton of good sugar beets is fully worth two tons of mangolds, and yet I have many returns showing a produce of from 20 to as much as 40 tons per acre of good sugar beets. So much for their profitable cultivation in Canada.

Now, then, remains the question of the saccharine value of our beets. Here, I am perhaps trampling on delicate grounds, for I am going to give you official information which is yet known, I believe by one only of the honorable ministers of the Crown. This information has been diligent-

ly, but unobtrusively searched for by the Department of Agriculture in Quebec, ever since my return from Europe in 1872. Before giving you this bit of valuable information, which has cost the local government a considerable penny, and its officers a great amount of studious and persevering labors, I must show you by a few figures, how very important is this matter of the saccharine quality of the beet.

It is a fact admitted by all manufactures of sugars that putting the commercial

Value per ton of sugar beets containing 9 per cent. of sugar in the juice with a purity of.....				at	
85.7					\$3.72
9	"	"	"	86.6 would be worth	2.72
10	"	"	"	87.	4.54
"	"	"	"	70.	3.47
11	"	"	"	88.	5.54
"	"	"	"	71.6	4.52
12	"	"	"	89.	6.37
"	"	"	"	72.1	5.39
13	"	"	"	89.6	7.27
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by which it clearly appears that a careless farmer will produce beets hardly worth \$2 a ton, for many beets do not contain 9 per cent. of sugar, whilst the careful producer, who follows the dictates of experience, will produce beets worth over \$8 a ton for the production of sugar.

Now, gentlemen, we come to the point, What is the saccharine quality of our Province of Quebec sugar beets? The answer I am going to give you is official, and not yet known outside of the department of agriculture in Quebec. Some trials and analysis of beets have been made from year to year, but, unfortunately, from want of the proper experience, the beets cultivated previous to this year proved rather poor in sugar. This fact we know was due to want of care in the cultivation of the beet, on the part of the farmers, and also, to a degree, from inferior seed.

Last year the department imported what was guaranteed as excellent seed. It was distributed through the members of Parliament, in most cases, but unfortunately rather late in the season by most. This distribution was accompanied with printed instructions, insisting in the most pressing terms, on the special mode of culture necessary to the production of the best sugar beets.

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In the fall, circulars were again issued, from the Department, requesting that samples be sent of the beets cultivated, with answers to several questions therein contained, relating to the mode of culture, of manuring, the time of seeding, of cropping, &c., &c. Several hundreds of answers were sent in, accompanied by about 300 samples of beets. Out of these, 235 samples have been carefully analyzed by Mr. Octave Cuisset, a special chemist, attached to the Department, who has had an experience of many years in the practical manufacturing of beet sugar, both in Belgium and France, and who actually manufactured some coarse unrefined sugar from Canadian beets, merely to show he understood his business.

In order to obtain the most convincing proof possible as to the value of the analysis made in our department, we sent over twelve samples each to France and to Belgium for analysis, to the best recommended special chemists in those countries, gentlemen who have now been consulted for the last three years by the Department of Agriculture. These samples sent to Europe were selected out of similar lots produced on twelve different farms in various parts of the Province; they were all numbered carefully, and many weeks before the answers came over from France and Belgium, we caused to be published and printed, in the Department report of 1876, the analysis made here on the same lots as those sent to Europe. I received the answers from Europe a few days ago only.

What are the results? may you ask. I will say that they deserve your most careful consideration. They are:

Firstly. That the various analysis made in France, in Belgium and in Quebec, on the twelve identical lots above mentioned hardly differ at all—no more than could have been expected from different beets grown in the same field—proving that our analysis are entirely to be trusted.

Secondly. That the system of cultivation followed here this year has been by no means perfect, and that, in consequence, a still higher degree of richness in the beet can be attained.

Thirdly. That notwithstanding our inferior mode of cultivation, the Quebec beets as a whole, are considerably richer than the average obtained this year either in France or in Belgium.

I will now read you a few extracts from the above mentioned official reports from France and from Belgium. Mr. Julien de Puydt, the chemist consulted in Belgium, says:

"This lot of beets (of 1876) is the third we received from Canada, and we can state that they are much better than those sent us last year * * * * *

In this last lot, the roots, with one or two exceptions only, are all of an excellent type; two or three are rooty and forked, and were grown rather too much out of the soil. This may depend on some local condition which we ignore. At all events, a better preparation or mellowing of the soil, and deeper culture will no doubt remedy this evil."

"The degree of purity representing the proportion of foreign matter to sugar contained in the juice, has attained an average of 81.05 which is excellent."

"The percentage of sugar in the juice is 12.50 per cent. which is also very good, in beets weighing two pounds and a half. These figures show conclusively that the seed sown was good, and also, that Canadian soil is eminently fitted (*essentielllement propre*) to the cultivation of the sugar beet, — on the condition, necessary everywhere, that it be properly prepared, and that the variety of seed sown be carefully selected." This is the Belgian verdict.

I will now give the concluding remarks of the French chemist's report, Mr. L' Hote, who says: "The Canadian beets of 1876 have given, by analysis, an average of 12.45 of sugar for 100 parts of juice."

"The average saccharine quality of the Canadian beet is superior to that obtained in France."

"The average obtained in France for the present year is 10.30 for 100 parts of juice."

"In France the head of the beet is thrown aside as refuse, and does not enter into the manufactory of sugar.

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amounts to 8 per cent. of the whole weight of the beet, but we have found that even these contain 10.22 per cent. of sugar in 100 parts of juice."

This report thus shows that our Canadian beets are over 20 per cent. richer than the French beet, and that our refuse heads of beets are as rich, or nearly so, as the better parts of the French beet.

In presence of these facts, gentlemen, it seems very evident that this question of the production of beet sugar in Canada is of national importance, and that, from an agricultural point of view, it is perhaps the weightiest problem which we, as agriculturists, can be called upon to work out to a favorable issue. Let it be remembered that we can grow beets here as cheap as in Europe, that Canada imports annually about 165 millions of pounds of sugar and molasses which cost, laid down here, over twelve millions of dollars. Also consider that the manufacturing of this quantity of sugar would necessitate the establishment of over fifty large sugaries, giving work in one way or another, to 15,000 men, besides the farmers; that it would enable the farmer to grow annually, with great profit to himself, and with great advantage to the country around, 60,000 acres of beets, at 20 tons per acre; that it would produce annually 240,000 tons of refuse or beet pulp, which would cost nothing to the farmers and yet would be worth as much to them as 80,000 tons of hay* That it would also enable us to keep four times more stock on our farms, quadruple our barn yard manures, besides enabling us to purchase an abundant annual supply of artificial manures, which would all be paid by the beet crop and leave a large profit.

In presence of these facts I may well say, gentlemen, that the day when a factory of beet sugar will be established in the Province of Quebec will be a happy day for

us all, and that it behooves all of us and every farmer in this Province, to study out this question carefully for himself. If what I have here stated is correct, and I can vouchsafe for the correctness of each and every one of the above statements,—I say, if what I have stated is correct, it becomes the duty of every patriotic Canadian to work earnestly and well, in fact to leave no stone unturned until this object, of such national magnitude from an agricultural point of view, be successfully attained.

I may here say that our Local Legislature so well understands the importance of this matter, that as far back as 1873 it passed a law offering \$25,000 as a premium to the first successful manufactory of beet sugar in this Province, and that in 1875 this premium was increased to \$7,000 annually for ten years, which is equal to the sum of \$70,000.

However, gentlemen, I must say that the manufacturing of beet root sugar is of a very complex nature, that it requires the ablest chemists, and practical men of highly scientific attainments before it can be carried out with success. And what is still more difficult to attain perhaps, it will require especially for the first start, a very large capital indeed, which, I am afraid, will amount to \$350,000 in order to secure success. On the other hand, from all the information I can gather, and I think I have gathered a good deal on the subject, no industry in Canada will ever have given such a large return, for the amount put into the enterprise if only properly conducted.

The capital above mentioned would not only suffice to produce marketable white sugar, but also would cover all the necessary outlay for the production of the beets needed by the factory, leaving an ample margin to meet all unforeseen contingencies.

* Some authors even estimate that the beet pulp, properly pressed, is worth twice as much as the comparative value given above. They say that 35 lbs of pulp is equal to 25 pounds of the best hay.

ADDENDA.

With respect to the free trade theories of France, mentioned at page 2, it may be useful to say that, about 1829, the outcry of free-traders was to the effect that the manufactory of beet-sugar, by ruining France's colonial trade, would be equally injurious to the colonies, to the shipping trade and to all connected with cane-sugar dealings. At that time the whole consumption of sugar in France was 35,000 tons annually, 4000 tons of which was beet-sugar produced in the country, and 31,000 tons imported cane-sugar. It would therefore appear that free traders were contending for a carrying trade of not more than 35,000 tons. Protection to the home industry, in beet-sugar, carried the day; let us now see with what results:

In 1875-6, France produced as much as 462,000 tons of beet-sugar annually. Yet she imported about 200,000 tons annually of cane and other sugars. The whole is refined in France, 225,000 tons are annually consumed and the balance of about 437,000 tons is exported. The carrying trade in sugar alone, through proper protection to this home industry, has therefore increased in 46 years, from 35,000 tons to 862,000 tons, this is counting the importation and exportation of sugar, added to the local consumption.

To this enormous trade, thus created, must be added the consumption of two millions of tons of coal required for the manufactory of beet-sugar alone, besides the innumerable benefits to commerce, and still greater benefits to agriculture, obtained by the creation of such a stupendous industry. In fact it is well ascertained that France would never have survived from the disasters of her late war had it not been for the immense agricultural wealth created and hoarded, all over the country, either through its beet-sugar factories or its vine culture.

However, it is only fair to say that Canada offer the fullest protection to beet-sugar manufactories: as its importation duties average 45 per cent on the invoice cost of sugar, to which must be added 10 or 12 per cent for the cost of importation.

The beet may be produced and manufactured into sugar in Canada for about the

cost in France. The profits should therefore be such as to induce the creation of a test factory, and then, after full success be obtained for this one, the creation of a sufficient number of factories, in order to produce all the sugar and molasses consumed in Canada.

Page 5, 6th line.—In Germany, an acre of good beets gives from 3200 to 3750 lbs of sugar.

Taking the lowest estimate of the value of beet pulp, we have an equivalent per acre of two tons of the best cured hay, or much more than is produced by the best meadows. Thus the farmer would obtain:—1. a very highly remunerative price from the sale of his beets; 2. The cleaning and mellowing of his soil for the following crops, and therefore increased crops during the whole of his rotation; 3. Beet pulp equal to two tons of hay per acre; 4. He could feed in addition to this pulp his straw, which, with pulp and a little coarse grain, becomes a highly fattening food. The above will sufficiently demonstrate the great advantages of the beet-sugar industry, from an agricultural point of view. With regard to the industrial and commercial interests, an indispensable article of food will be produced in the country, which now must be purchased abroad, at a cost of over seven millions of dollars. This sum would then be retained in this country, circulate, feed and cloth thousand of families connected with the new industry, foster other industries, and would create new wealth in many ways. As an illustration of the latter assertion, I have but to state that the production of 57,000 tons of sugar will require 230,000 tons of coal annually; a quantity which would create quite a trade by itself, and might considerably assist in opening up and fostering our own coal fields in the lower Provinces and giving constant freight to several hundred vessels.

Besides the production of sugar for Canadian consumption, it is not at all impossible that we might come to export sugar with profit, considering the special advantages we possess on account of the richness of our sugar-beets, and our long winter which will

enable us to produce, with the same machinery, double the quantity produced in Europe.

Since the above was printed the writer has been asked if the drawbacks given to American refiners, by which our own sugar refiners have been all but ruined, would not prove equally disastrous to the Canadian beet-sugar manufacturer. I see no analogy whatever in the position of the sugar refiner and the would-be sugar manufacturer in Canada. The refiner has to import his sugar, on which he pays 25 per cent duty, *ad valorem*, and $\frac{1}{2}$ of a cent per pound before he can begin his operations; whilst the merchant imports refined sugar at 25 per cent, *ad valorem*, and one cent per pound. The only margin for profit given to the Canadian refiner is therefore $\frac{1}{2}$ of a cent per pound, from which he must deduct his expenses

and a certain percentage for waste. Now, if the American refiner really gains one cent per pound by the present system of American drawbacks, which is generally believed, it is easy to see that the American refiner can afford to undersell the Canadian refiner and ruin the latter entirely. But not so the beet sugar manufacturer, who would have no duty whatever to pay, who can produce a merchantable article of excellent quality, and who would benefit to the extent of the whole amount of custom duties on imported sugar, besides the cost of importation, which amounts to about 10 or 12 per cent on the invoice price. A protection which as before stated, is equal to about 55 per cent on the invoice price of sugar in the States or in other foreign countries, and which promises a larger profit than any Canadian enterprise of magnitude has obtained so far.

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